

Exhibit C

## Information Retrieval and Display System

Inventor:  
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#### **FIELD OF THE INVENTION**

This invention relates to information retrieval and display in a networked communications environment and is hereinafter referred to as "IRDS". The networked communications environment ("Network") includes Wide Area Networks (WAN), Metropolitan Area Networks (MAN), Local Area Networks (LAN), wired and wireless systems that permit multiple computers to communicate utilizing a set of protocols, such as Transmission Control Protocol/Internet Protocol (TCP/IP) and Hypertext Transfer Protocol (HTTP), in a internet, intranet, or extranet environment. An embodiment of IRDS may be, but not limited to, a standalone application computer program or an add-on to an existing computer program, such as a conventional web browser including but not limited to Microsoft's Internet Explorer and Netscape's Navigator.

IRDS (i) calls a search engine program, which may be embedded in the browser or available as a Network resource and provides the search engine with a search topic and any available options and search constraints; (ii) accepts a list of hyperlinks returned by the search engine, where the hyperlinks points to where the web pages are expected to reside on the Network; (iii) concurrently loads one or more pages from the Network into the browser; (iv) directs the browser to displays one or more such pages in the browser simultaneously and (v) operates on one or more pages at the same time with subsequent direction provided to the browser. A browser that has been enhanced with IRDS capability will be hereinafter referred to as "Enhanced Browser".

IRDS capitalizes on the availability of (i) high bandwidth networks, such as Broadband cable networks rated at up to 1.5 Mbits/sec. and Digital Subscriber Line (DSL) networks rated at up to 1.5 Mbits/sec., but also may be available at 384 or 768 Kbits/sec.; (ii) multithreaded computer architectures; (iii) large inexpensive computer memory storage.

1   **BACKGROUND**

2  
3   Common search engines “Search Engines” include, but are not limited to Google,  
4   Yahoo!, AltaVista, Lycos, Webcrawler, Excite, Northern Light, MSN Search, iWon,  
5   HotBot, AlltheWeb, Teoma, DMOZ, DOGPILE, WizeNut, Overture, AOL, Ask Jeeves,  
6   Inktomi, LookSmart, and Netscape. Search Engines differentiate themselves mainly on  
7   content and features. The size of the search engine database is one of the content metrics.  
8   Specialized content hyperlinks may include: news, music files, auctions, employment,  
9   insurance, loans, yellow pages, white pages, email addresses, sports, shopping, movies,  
10   classifieds, health, images, movies, home life, finance, stocks, and travel. Features may  
11   include search options such as: language selection, word exclusion, exact phrases to be  
12   returned, number of pages to be returned, file format, returning results from specific  
13   website domain, and content blocks. Some search engines are website domain specific  
14   such as Dell, GM, and Sears and are accessed from their respective websites.  
15  
16   Web browsers include but are not limited to Internet Explorer, Netscape Navigator,  
17   Mozilla, Opera, Konqueror, and Galeon. Web browsers have differentiated themselves by  
18   computer operating system support (such as Apple, Microsoft Windows, and Unix), page  
19   download speed, computer memory usage and compliance to standards.  
20  
21   Today, there are two common methods searching for information on the Internet. First is  
22   a serial process of using a web browser to go to a Search Engine website; entering the  
23   search topic, options and constraints; executing the search; a list of hyperlinks (usually a  
24   set of ten (10) at one time) are returned and displayed by the web browser; clicking on a  
25   single hyperlink from the list; being vectored to the associated website; reviewing the  
26   information that resides on the website in the browser; and returning to the Search Engine  
27   website to click on another hyperlink to continue the process for each such successive  
28   hyperlink. To view the next set (usually ten) of hyperlinks requires selecting a hyperlink  
29   to render the next set of hyperlinks in the browser. This laborious ping-pong process  
30   between the websites and the Search Engine hyperlink list is continued until the sought

1 after information is found or by quitting the search, if there is simply not enough time to  
2 find the information.

3

4 The second common search method requires a web browser with integrated search. This  
5 type of browser, such as Microsoft's Internet Explorer, allows a search topic, options and  
6 constraints to be entered into the browser, without first going to the search engine  
7 website. The search engine itself is not required to be part of the browser. The browser  
8 can contact the search engine and pass the topic to search, options, and constraints. The  
9 list of hyperlinks returned from the search engine can then be formatted and displayed in  
10 the browser. A list of hyperlinks is usually displayed in one panel of the browser, similar  
11 to the first search method. In a second browser panel an image and description of the  
12 page associated with the hyperlink is displayed. These images are simple hyperlinks to  
13 the associated website. This has distinct advantages over the first method in not returning  
14 to the search engine website to select each successive hyperlink.

15

16 There are multiple inherent problems that stem from an age where network bandwidth  
17 was limited and costly. Internet browsers are mostly serial from the users perspective as  
18 'search the web' is an analogy for hopping between a Search Engine website and the  
19 websites from the Search Engine hyperlink list. Even method two searches (browsers  
20 with integrated search) requires selection from a hyperlink list (text or hyperlinked  
21 image) to display the next website page associated with that hyperlink. Every website has  
22 its own latency in responding to a browser, such that the browser can download the page  
23 and render the page in the display. Hence the time to review multiple website pages  
24 includes the website response time and Network latency from every website. The time to  
25 select the next hyperlink must be added to this latency as well. If the average website  
26 response time and Network latency per page is 7 seconds and the time required to select  
27 the next hyperlink is 3 seconds, then the extra time to get to the next website page from  
28 the hyperlink list is 10 seconds per hyperlink. To review 400 hyperlinks listed by a  
29 Search Engine would then require over 1 hour of extra (wasted) time. Method one search  
30 take even longer, as the user must first return to the Search Engine website before  
31 selecting the next successive hyperlink.

1 An Enhanced Browser solution is needed that removes the foregoing requirements and  
2 makes searching for information a fast efficient process that displays not text hyperlinks  
3 or image hyperlinks to websites, but displays the web pages themselves one or more at a  
4 time.

5

6 **SUMMARY**

7

8 An Enhanced Browser is described that removes the requirements (i) to go to a Search  
9 Engine website to start a search; (ii) to select a hyperlink returned by the Search Engine  
10 to review the next website page; and (iii) to select the “next set” hyperlink to render the  
11 next grouping of hyperlinks associated with the search topic. Such an Enhanced Browser  
12 allows multiple web pages to be displayed simultaneously and operated on individually.

13

14 This Enhanced Browser sends the search topic, options and constraints to one or more  
15 Search Engines without going to the Search Engine websites. The lists of hyperlinks  
16 returned from one or more Search Engines is aggregated and prioritized by the Enhanced  
17 Browser. The Enhanced Browser loads a number of the associated website pages into the  
18 Enhanced Browser concurrently for review. The number of pages to load concurrently  
19 will depend on the Network bandwidth, how much computer memory is available, and to  
20 a much smaller degree, the computer processor speed. Network bandwidth, computer  
21 memory, and processor speed will be collectively referred to as “Power”. If sufficient  
22 Power is available, all the pages may be loaded concurrently and made available for  
23 Enhanced Browser display. In a more likely scenario, there will be some Power  
24 limitations.

25

26 The Enhanced Browser solution should provide a selectable number of pages to be  
27 loaded concurrently after a search is started from the list of hyperlinks that the search  
28 engine returns (“Concurrent Page Loading”). In addition to this Concurrent Page  
29 Loading, one or more look-ahead page loading mechanisms should be provided for the  
30 remaining unloaded pages, to ensure a near instantaneous page review experience.

31

1 Look-ahead page loading mechanisms can apply to conventional browsers, as well as, an  
2 Enhanced Browser. Such mechanisms could include (i) a next-in-queue look-ahead page  
3 loading method (“Next-In-Queue Page Loading”); (ii) a periodic opportunistic look-  
4 ahead page loading method (“Periodic Opportunistic Page Loading”); (iii) and/or a  
5 preemptive descendant look-ahead page loading method (“Preemptive Descendant Page  
6 Loading”).

7  
8 Next-In-Queue Page Loading refers to a method that loads the next page or pages pointed  
9 to in a hyperlink queue that haven’t been previously loaded by Concurrent Page Loading,  
10 Periodic Opportunistic Page Loading, or Preemptive Descendant Page Loading. While  
11 one or more web pages are being displayed in the Enhanced Browser, these pages can be  
12 preloaded and subsequently displayed in an Enhanced Browser on demand.

13  
14 Periodic Opportunistic Page Loading refers to a method whereby the hyperlink queue is  
15 scanned periodically for unloaded pages and preloads one or more of these pages, which  
16 may then be subsequently displayed in an Enhanced Browser on demand. These pages  
17 may be selectively preloaded depending on which pages are currently displayed, user  
18 preferences and/or other criteria, hence the preloading order is not required to be  
19 sequential.

20  
21 Web pages (parents) referred to by the list of search engine hyperlinks may contain  
22 hyperlinks that point to other web pages (children), which in turn may contain hyperlinks  
23 that point to other web pages (grandchildren), in perpetuity collectively “Descendants”.

24 Preemptive Descendant Page Loading refers to a method that preloads selected  
25 Descendants. Any such Descendants would be visible in the Enhanced Browser on  
26 demand. A selectable limit on the number of Descendants pages or generation of  
27 Descendants to preemptively preload should be provided, as the number of possible  
28 pages to preemptively load rises exponentially.

29  
30 The Enhanced Browser allows one or more pages to be displayed at the same time, with  
31 pages from (i) the same website domain; or (ii) differing website domains. These pages

1 would be fully active website pages, as if the multiple browsers were encapsulated in a  
2 master browser.  
3  
4 The Enhanced Browser would have a control panel to (i) operate on the pages which may  
5 include functions: to zoom in or out on a page; change the number of pages displayed;  
6 find and highlight the search topic within a page; display the next page or next set of  
7 pages depending on the number of pages being displayed at a given time; display any  
8 selected page or any set of pages depending on the number of pages displayed at a given  
9 time; bookmark selected pages or all the pages as a list of hyperlinks that can be recalled  
10 and the associated pages can be loaded into the Enhanced Browser without calling a  
11 Search Engine; delete a selected page or pages thereby pruning the list of pages; (ii)  
12 select a Search Engine or multiple Search Engines to be contacted; (iii) enter a search  
13 topic for the Search Engine and any options, criteria and/or constraints; (iv) execute a  
14 search; (v) display search statistics such as the number of hyperlinks returned by the  
15 Search Engine(s); and (vi) display page number(s) being viewed, highest page number  
16 preloaded, Network bandwidth, memory usage, and/or processor usage statistics.

17  
18 **BRIEF DESCRIPTION OF THE DRAWINGS**  
19

20 The present invention is described with respect to particular exemplary embodiments  
21 thereof and reference is accordingly made to the drawings in which:

22  
23 Figure 1 shows the distributed network environment for a conventional information  
24 search utilizing a search engine and web browser on a computer.  
25  
26 Figure 2 shows a typical search engine display in a browser with command and control, a  
27 list of textual hyperlinks returned from a search and optional value-add information.  
28  
29 Figure 3 shows a typical search engine display in a browser with command and control, a  
30 list of hyperlinked images returned from a search and optional value-add information.

1   Figure 4 shows a flowchart of the conventional information acquisition and review  
2   operation for a search performed with a conventional search engine.  
3  
4   Figure 5 shows a conventional browser with an integrated search function with command  
5   and control, a list of textual hyperlinks and a list of hyperlinked images returned from a  
6   search and optional value-add information.  
7  
8   Figure 6 shows a flowchart of a conventional information acquisition and review  
9   operation for a search performed with a browser with an integrated search function.  
10  
11   Figure 7 shows a flowchart of a browser serial page loading cycle after the browser has  
12   requested a new page from a website, if a valid cached copy is not available in computer  
13   memory.  
14  
15   Figure 8 shows that an Information Retrieval and Display System (“IRDS”) can be (i)  
16   added to a conventional browser as an add-on program or (ii) can be incorporated in a  
17   new browser to create an Enhanced Browser.  
18  
19   Figure 9 shows that IRDS can be local to a computer or distributed on a Network such  
20   that one or more computer can load and run IRDS across a Network.  
21  
22   Figure 10 shows the IRDS command, control, status panel and a single (1) fully active  
23   website page displayed.  
24  
25   Figure 11 shows the IRDS command, control, status panel, and two (2) fully active  
26   website pages displayed.  
27  
28   Figure 12 shows the IRDS command, control, status panel, and four (4) fully active  
29   website pages displayed.  
30

1   Figure 13 shows the IRDS command, control, status panel and nine (9) fully active  
2   website pages displayed.  
3

4   Figure 14 shows a flowchart of the IRDS information acquisition and review cycle.  
5

6   Figure 15 shows a flowchart of the IRDS search function.  
7

8   Figure 16 shows an IRDS directed, browser concurrent multiple page loading from one or  
9   more websites, after a search has been initiated.  
10

11   Figure 17 shows a flowchart that describes the IRDS directed, browser look-ahead Next-  
12   In-Queue Page Loading function, where when a request is made to view n pages, the next  
13   group of n web pages pointed to by the associated hyperlinks in the queue are loaded in  
14   display frames that are not visible but are immediately available to become visible and  
15   viewed upon demand.  
16

17   Figure 18 shows a flowchart that describes the IRDS directed, browser look-ahead Next-  
18   In-Queue Page Loading function, where when a request is made to view n pages, the next  
19   group of n+k ( where k is an integer greater than 0) web pages pointed to by the  
20   associated hyperlinks in the queue are loaded in display frames that are not visible but are  
21   immediately available to become visible and viewed upon demand.  
22

23   Figure 19 shows a flowchart that describes the IRDS directed, browser look-ahead  
24   Periodic Opportunistic Page Loading function. After a page is loaded into a browser  
25   display frame, the associated hyperlink in the hyperlink queue is marked as loaded. The  
26   Periodic Opportunistic Page Loading function scans the hyperlink queue for hyperlinks  
27   not marked as loaded and directs the browser to load one or more of the web pages  
28   pointed to by selected unmarked hyperlinks in display frames that are not visible but are  
29   immediately available to become visible and viewed upon demand. After directing the  
30   browser to load such pages, the unmarked hyperlinks are marked as loaded and the

1 function waits a specified period of time before rescanning the hyperlink queue and  
2 repeating the process.  
3  
4 Figure 20 shows a flowchart that describes the IRDS directed, browser look-ahead  
5 Periodic Opportunistic Page Loading function with page loading collision avoidance.  
6 After a page is loaded into a browser display frame, the associated hyperlink in the  
7 hyperlink queue is marked as loaded. The Periodic Opportunistic Page Loading function  
8 scans the hyperlink queue for hyperlinks not marked as loaded and directs the browser to  
9 load one or more of the web pages pointed to by selected unmarked hyperlinks in display  
10 frames that are not visible but are immediately available to become visible and viewed  
11 upon demand, if such display frame is not already in the process of being loaded by a  
12 different type of look-ahead function as described in Figure 17 and Figure 18 for  
13 example. After directing the browser to load such pages, the unmarked hyperlinks are  
14 marked as loaded and the function waits a specified period of time before rescanning the  
15 hyperlink queue and repeating the process.  
16  
17 Figure 21 shows a flowchart that describes the IRDS directed, browser look-ahead  
18 Periodic Opportunistic Page Loading function with page loading collision avoidance,  
19 Network saturation avoidance, and processor saturation avoidance. After a page is loaded  
20 into a browser display frame, the associated hyperlink in the hyperlink queue is marked  
21 as loaded. The Periodic Opportunistic Page Loading function scans the hyperlink queue  
22 for hyperlinks not marked as loaded and directs the browser to load one or more of the  
23 web pages pointed to by selected unmarked hyperlinks in display frames that are not  
24 visible but are immediately available to become visible and viewed upon demand, if (i)  
25 such display frame is not already in the process of being loaded by a different type of  
26 load-ahead function as described in Figure 17 and Figure 18 for example; (ii) the  
27 Network bandwidth has not become saturated; and (iii) the computer processor has not  
28 become saturated. After directing the browser to load such pages, the unmarked  
29 hyperlinks are marked as loaded and the function waits a specified period of time before  
30 rescanning the hyperlink queue and repeating the process.

31

1   Figure 22 depicts an IRDS directed, browser look-ahead Preemptive Descendant Page  
2   Loading, where the Descendant pages pointed to by hyperlinks that reside on pages that  
3   have been already loaded into display frames whether or not visible, are preemptively  
4   loaded into cache memory or frames that are not visible. A user then selecting a hyperlink  
5   on a visible page would immediately have the page associated with such hyperlink  
6   available on demand and made visible.

7

8   Figure 23 shows a flowchart and drawing associated with selecting the number of web  
9   pages to display at a given time.

10

11   Figure 24 shows a flowchart and drawing associated with selecting a page in a multi-page  
12   Enhanced Browser display and changing the zoom factor for a selected page.

13

14   Figure 25 shows a drawing associated with selecting a page in a multi-page Enhanced  
15   Browser display and making the selected page encompass the entire screen area allotted  
16   for the multi-page display, which is equivalent to setting the number of website pages to  
17   display to one.

18

19   Figure 26 shows a drawing associated with removing a selected page from a multi-page  
20   Enhanced Browser display and removing the hyperlink associated with the selected page  
21   from the hyperlink queue.

22

23   Figure 27 shows a drawing associated with book-marking a selected set of hyperlinks,  
24   where such set of hyperlinks can be recalled and used to reload the pages pointed to by  
25   such hyperlinks into the Enhanced Browser.

26

27   Figure 28 shows a drawing associated with jumping from an IRDS mode to a  
28   conventional browser mode for a selected page.

29

30   Figure 29 shows a drawing associated with selecting any portion of a displayed page or  
31   pages, if in a multi-page display mode, and creating an image in a standard image format,

- 1 such as Joint Photography Experts Group ("JPEG"), Graphics Interchange Format
- 2 ("GIF"), or bitmapped ("BMP") that can be saved to storage such as a hard drive or
- 3 Compact Disk (CD) or copied to another computer application, such as a word processor,
- 4 spread sheet, or presentation program.

5

6

1   **DETAILED DESCRIPTION OF THE INVENTION**

2

3

"Information Retrieval and Display System"

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"Information Retrieval and Display System"

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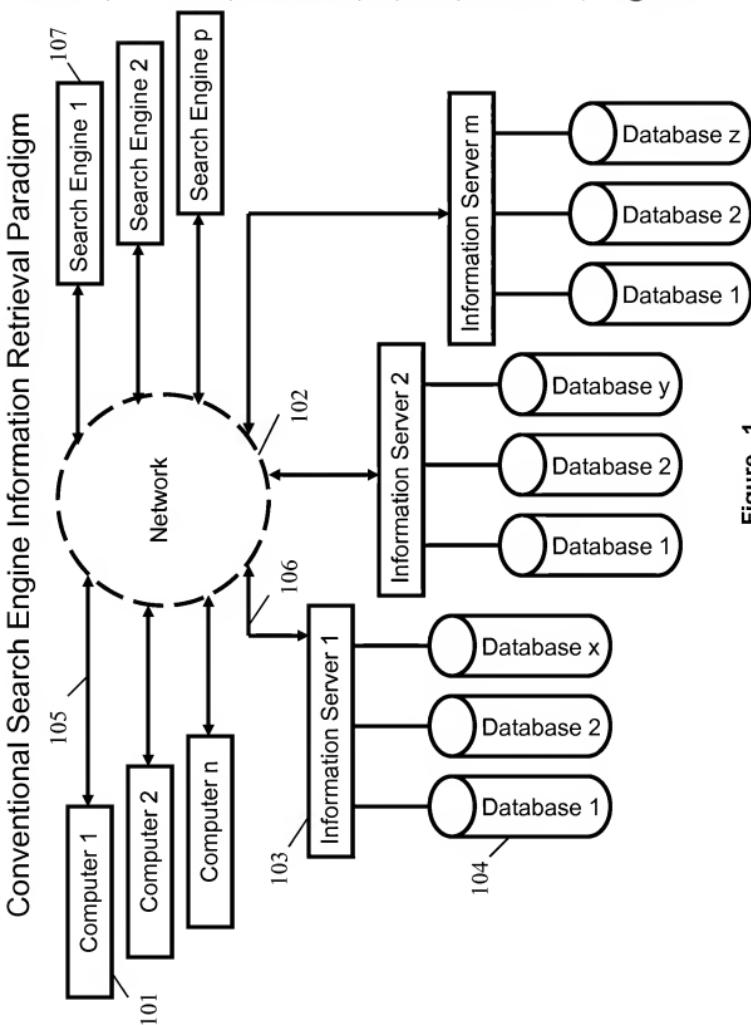


Figure 1

## Conventional Text Search Paradigm

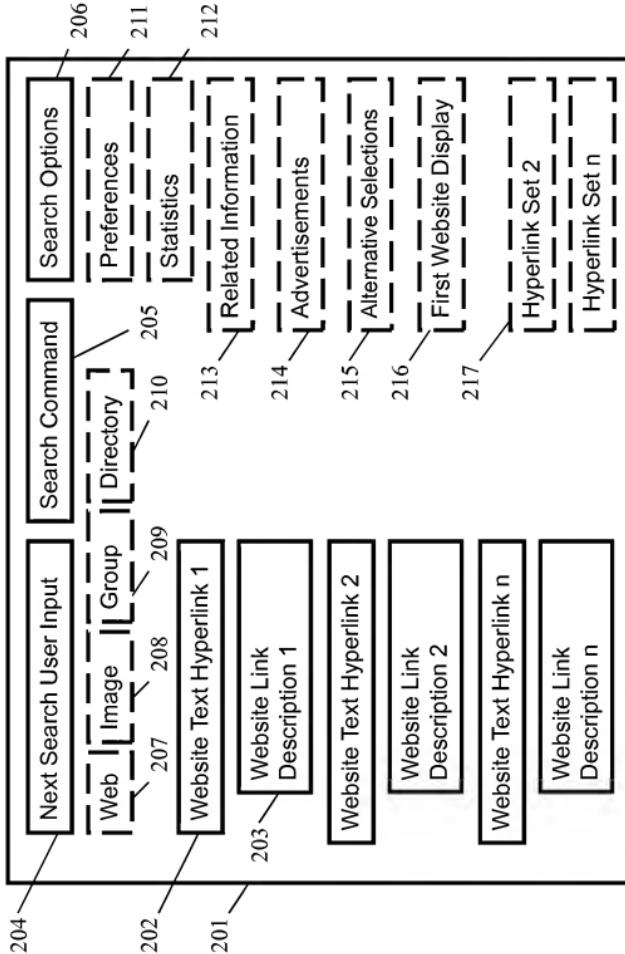


Figure 2

"Information Retrieval and Display System"

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Conventional Image Search Paradigm

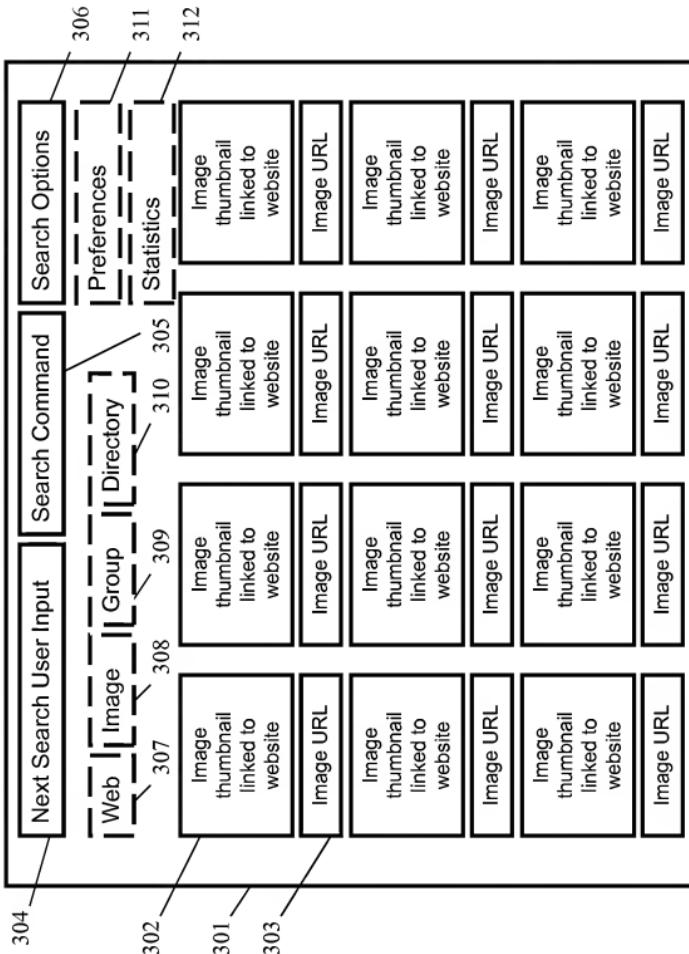


Figure 3

## Conventional Information Acquisition and Review Cycle

"Information Retrieval and Display System"

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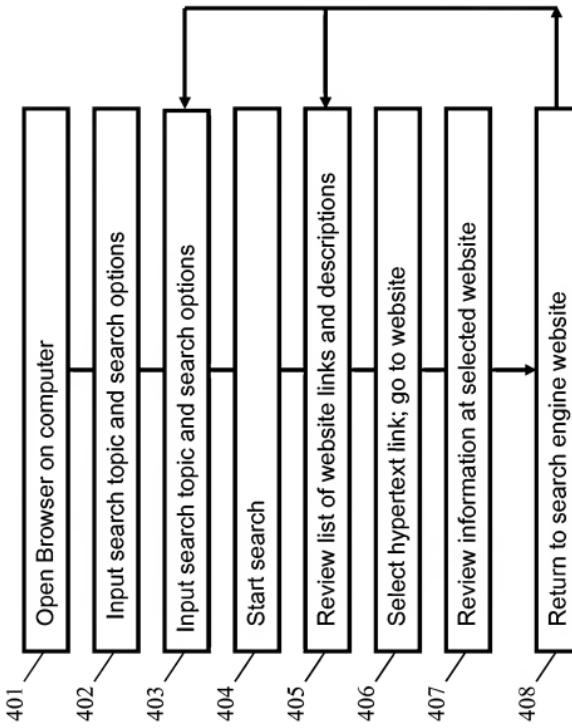


Figure 4

"Information Retrieval and Display System"

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Conventional Browser with Integrated Search

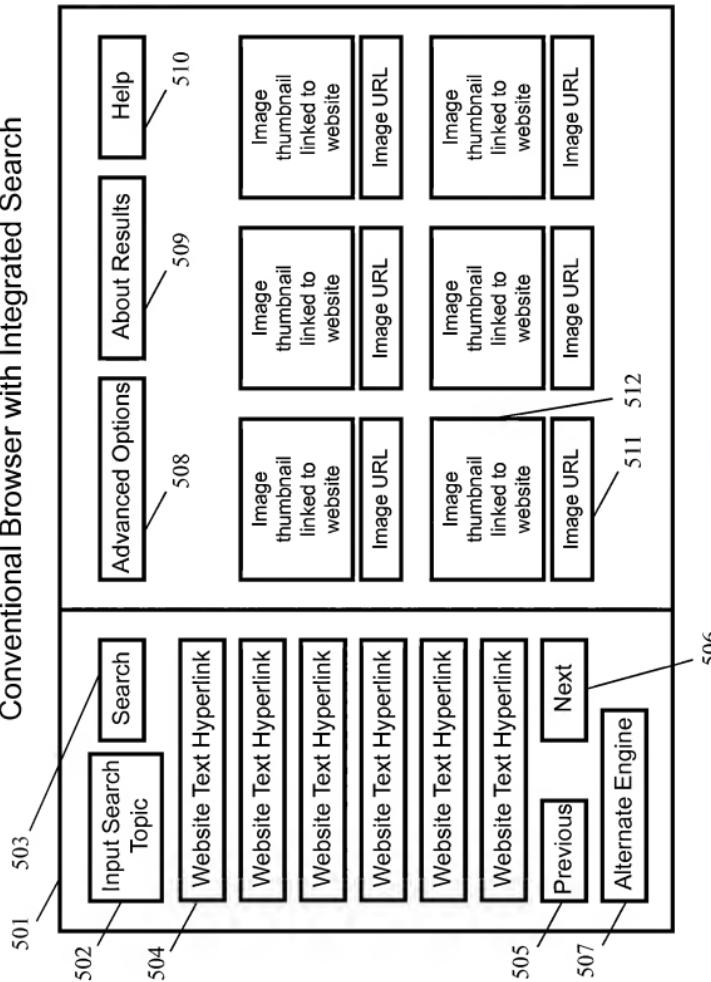


Figure 5

Conventional Information Acquisition and Review Cycle  
for Browser with Integrated Search

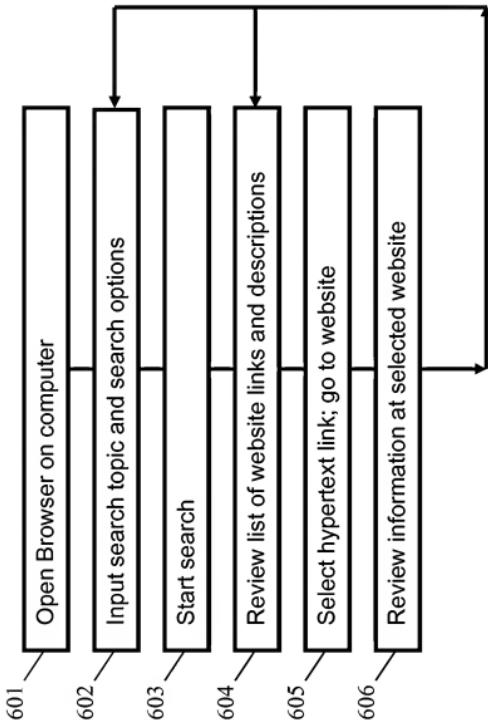


Figure 6

Conventional Serial Page Loading Cycle

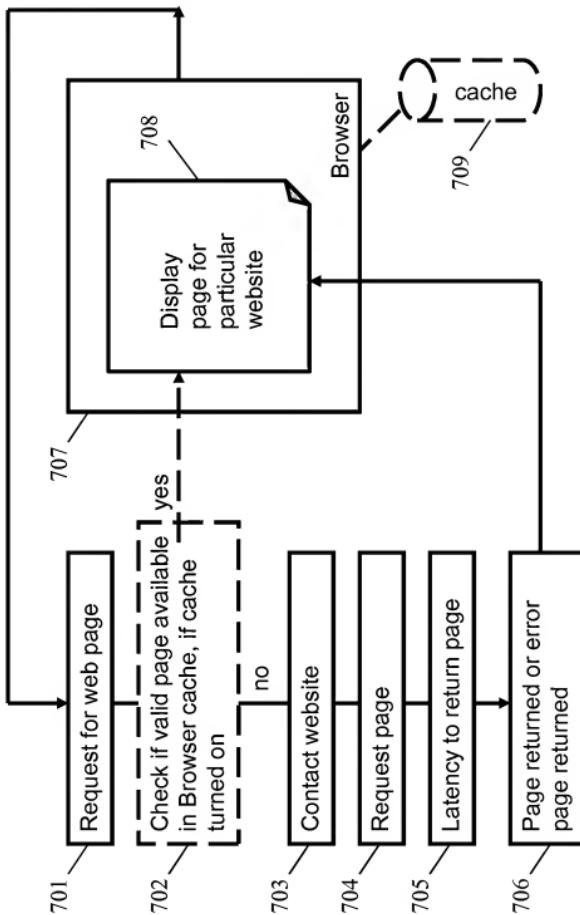


Figure 7

Information Retrieval and Display System ("IRDS")  
Add-on to Conventional Browser or IRDS Enhanced Browser

"Information Retrieval and Display System"  
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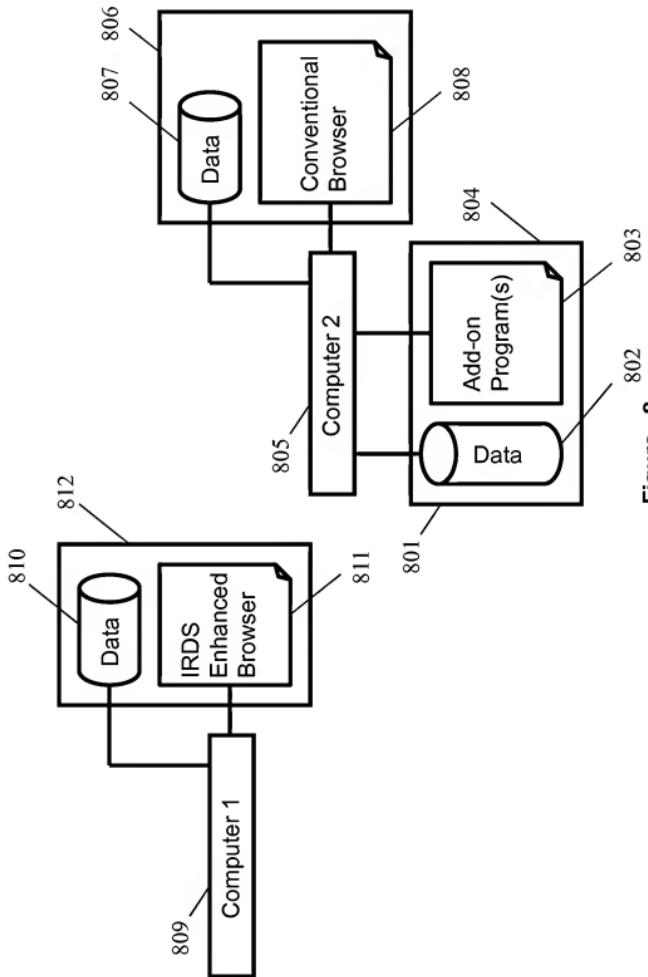


Figure 8

"Information Retrieval and Display System"  
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Local or Distributed IRDS and Data Access

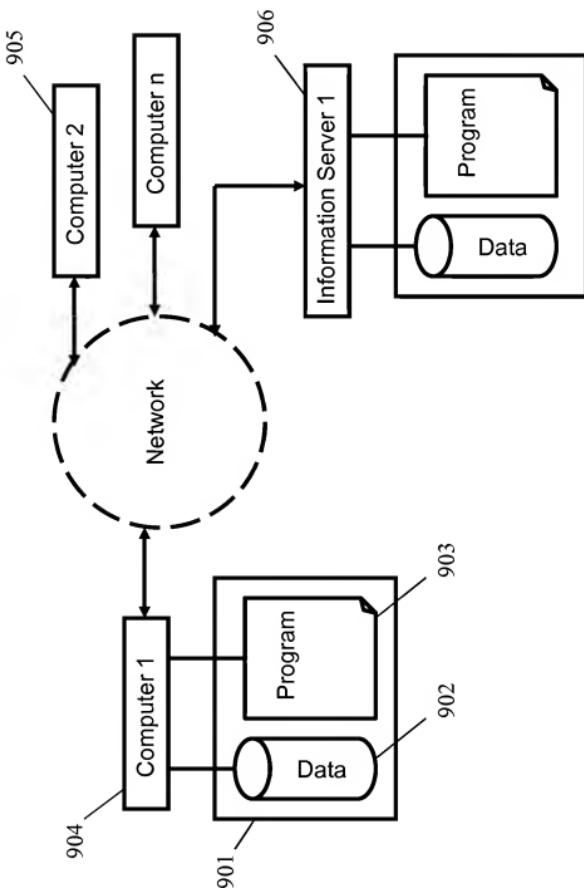


Figure 9

"Information Retrieval and Display System"

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Enhanced Browser Single Page Display

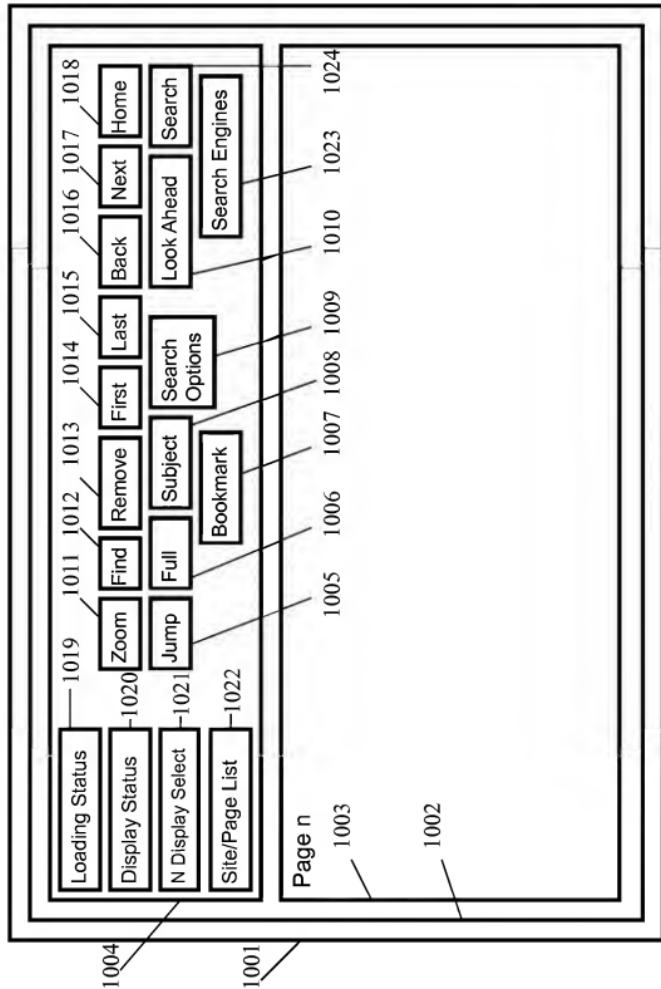


Figure 10

"Information Retrieval and Display System"

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Enhanced Browser Concurrent Multiple Page Display

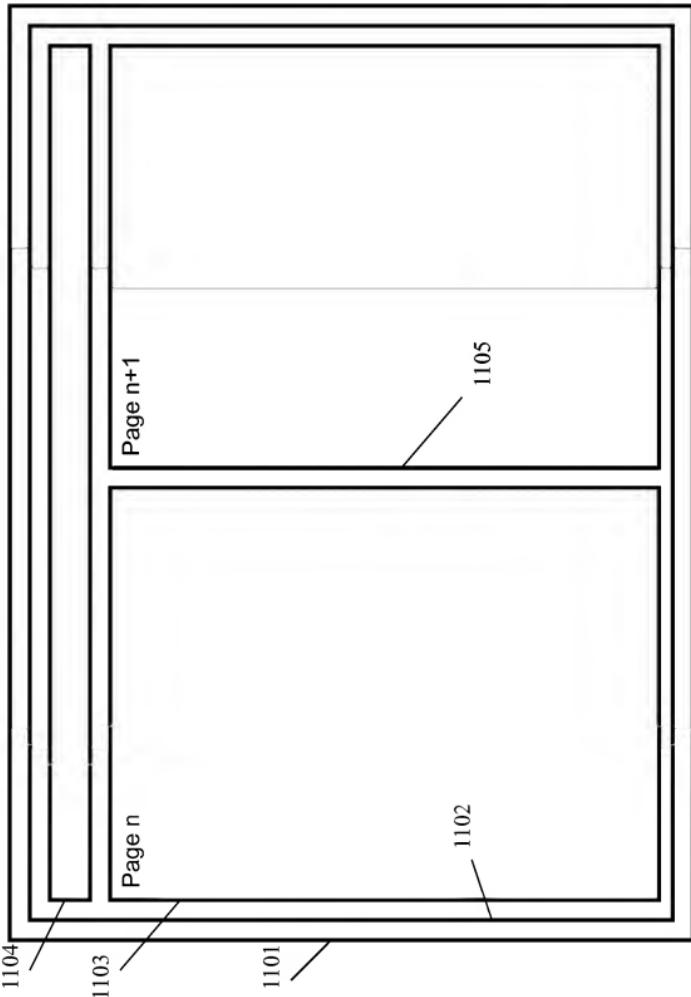


Figure 11

"Information Retrieval and Display System"

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Enhanced Browser Concurrent Multiple Page Display

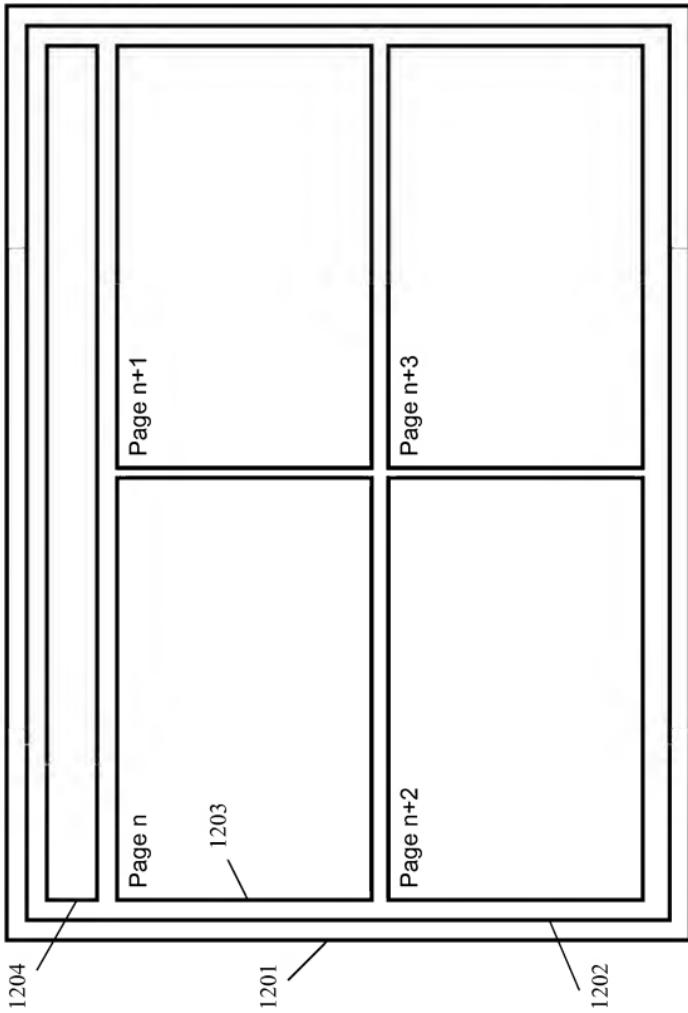


Figure 12

"Information Retrieval and Display System"

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Enhanced Browser Concurrent Multiple Page Display

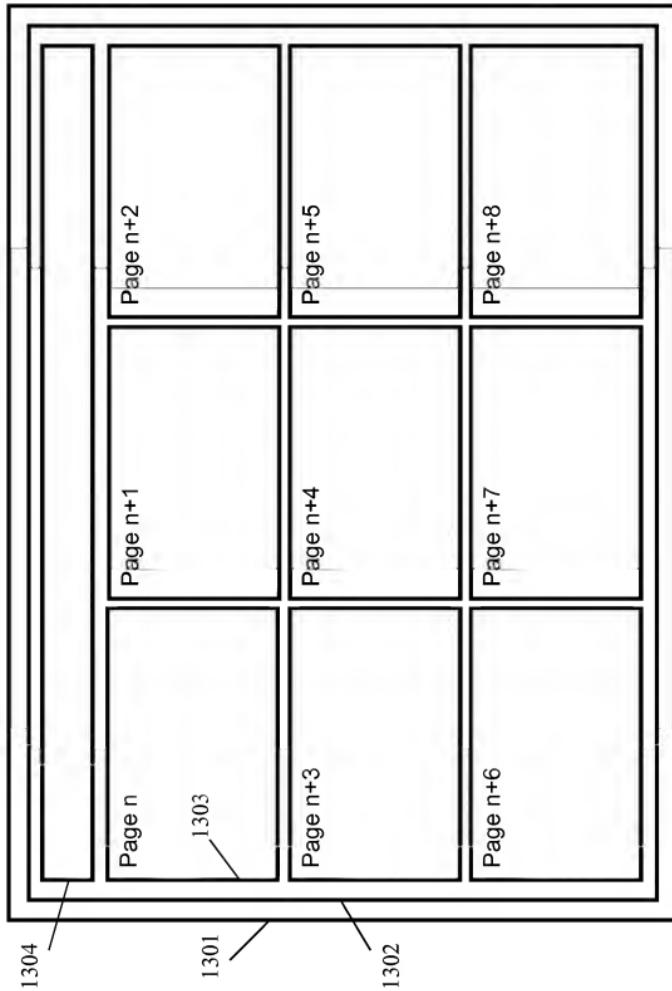


Figure 13

## IRDS Information Acquisition and Review Cycle

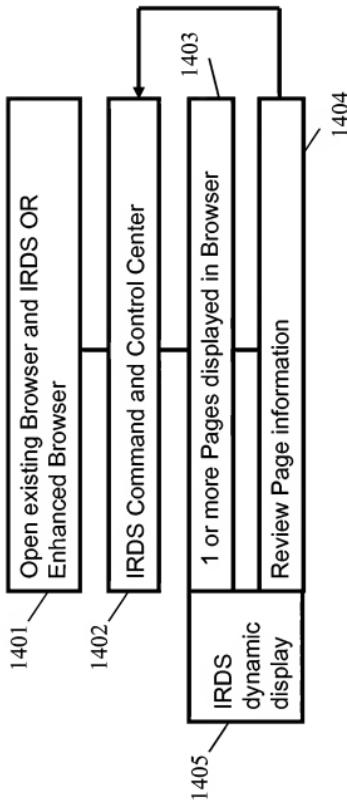
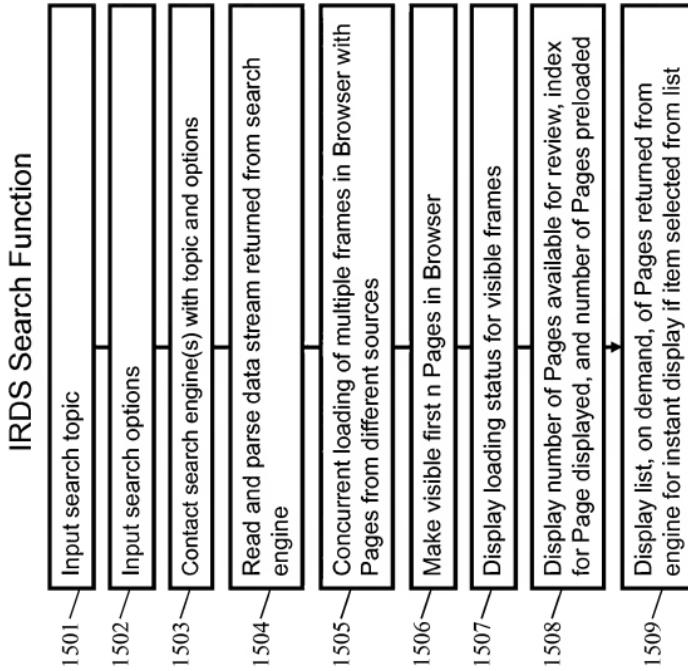


Figure 14



**Figure 15**

## IRDS Directed Concurrent Multiple Page Browser Loading

"Information Retrieval and Display System"  
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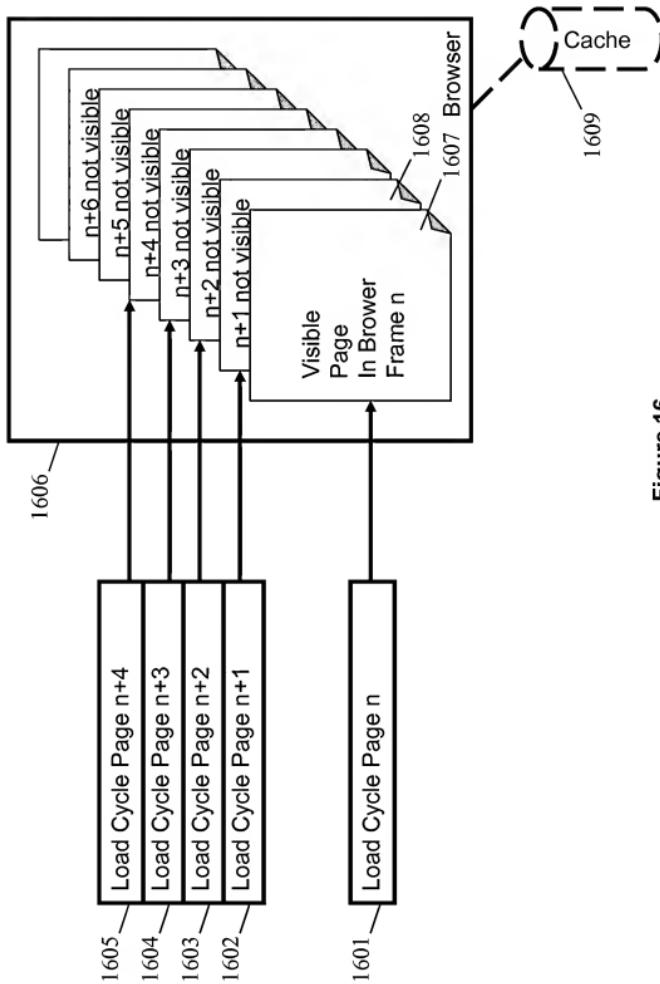


Figure 16

## IRDS Look-Ahead Symmetrical Next-In-Queue Page Loading

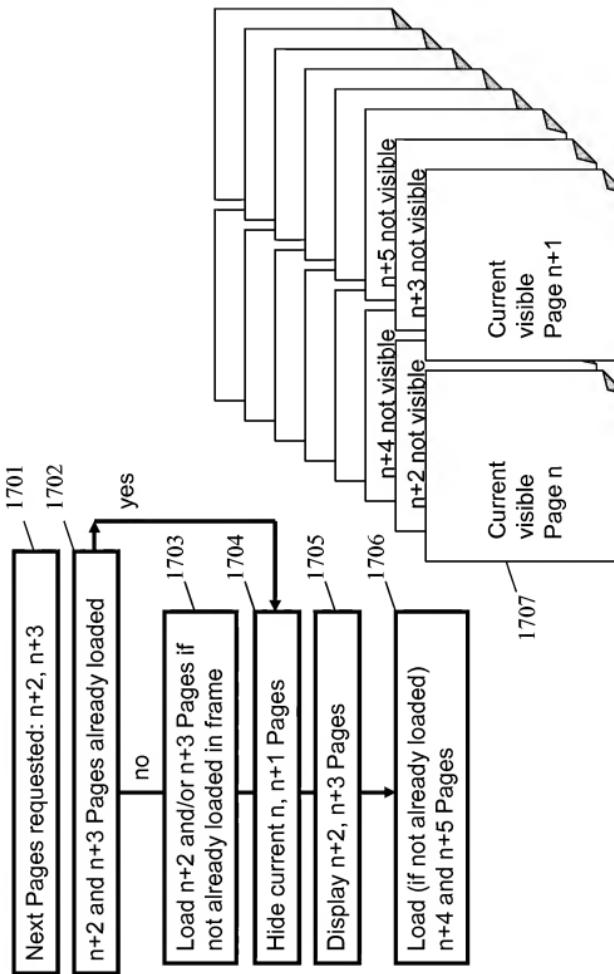


Figure 17

## IRDS Look-Ahead Asymmetrical Next-In-Queue Page Loading

"Information Retrieval and Display System"

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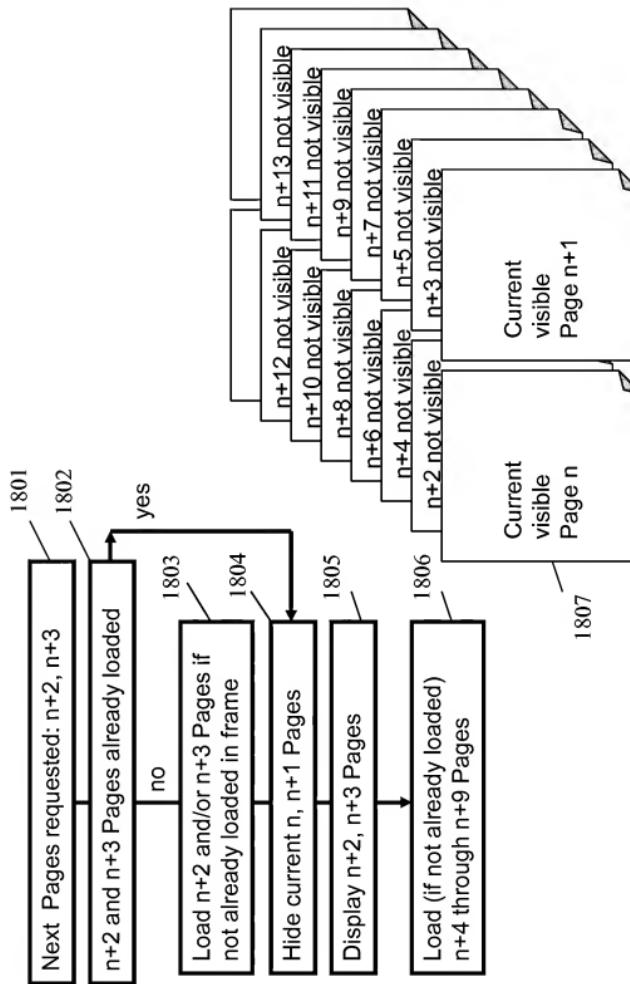


Figure 18

"Information Retrieval and Display System"

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IRDS Directed Look-Ahead Periodic Opportunistic Page Loading

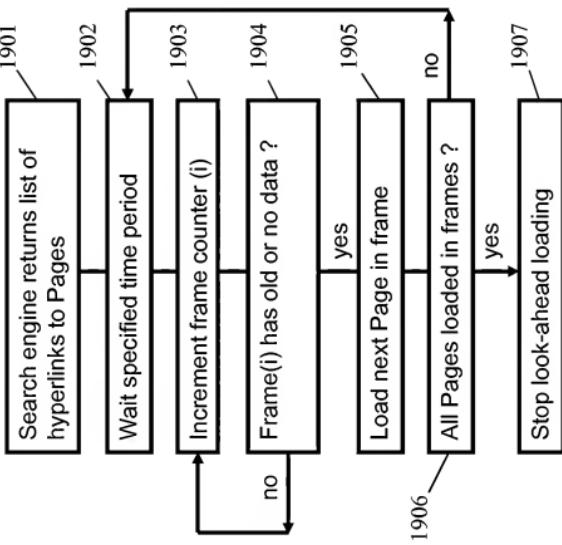


Figure 19

## IRDS Directed Look-Ahead Periodic Opportunistic Page Loading with Loading Collision Avoidance

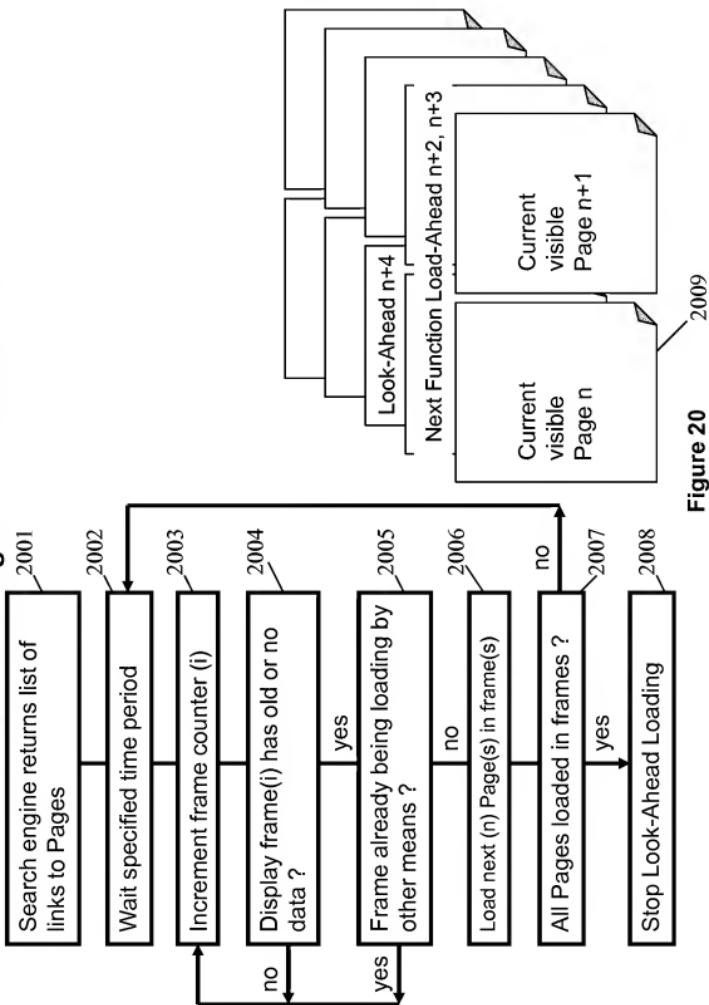


Figure 20

## IRDS Directed Look-Ahead Periodic Opportunistic Page Loading with Network and/or Processor Saturation Avoidance

"Information Retrieval and Display System"  
Alan Swahn, 95 Kara Drive, North Andover, MA, 01845, 978-794-1053, alan@swahn.com

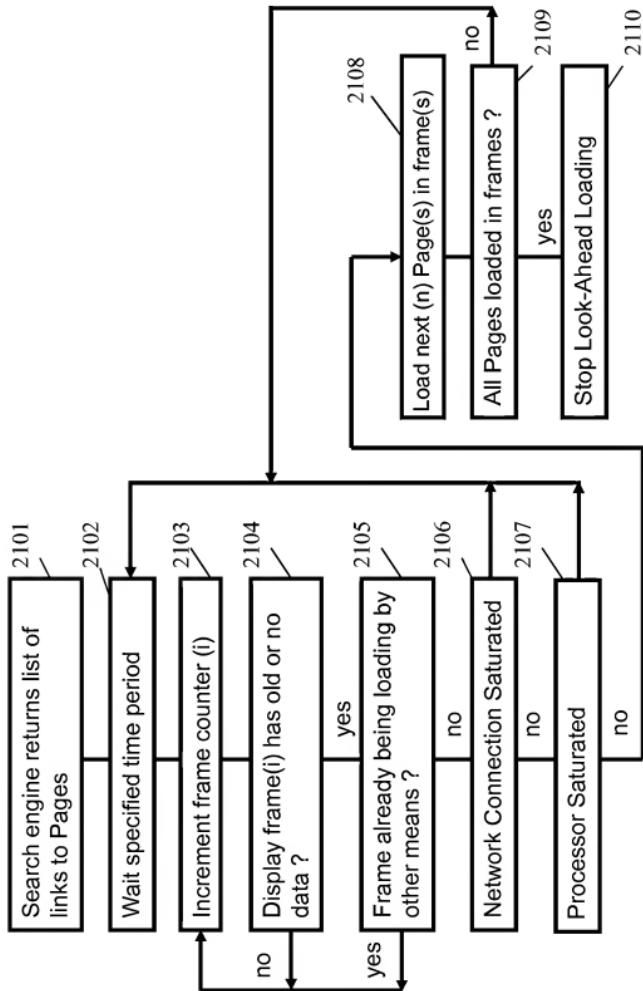


Figure 21

## IRDS Directed Preemptive Descendant Page Loading

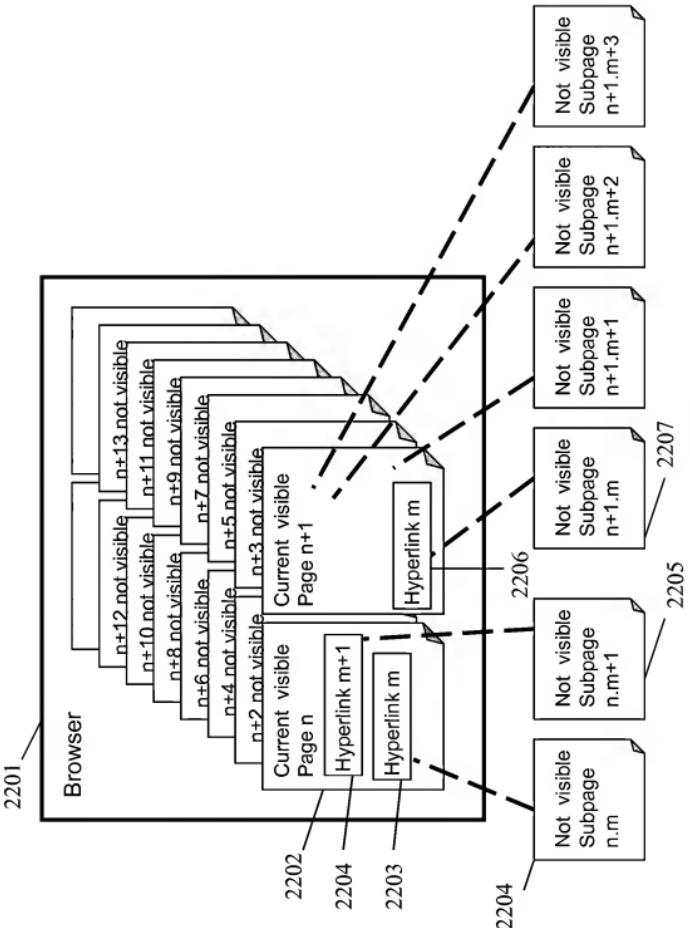


Figure 22

## Enhanced Browser Set Number of Pages to Display Function

"Information Retrieval and Display System"

Alan Swahn, 95 Kara Drive, North Andover, MA, 01845, 978-794-1053, alan@swahn.com

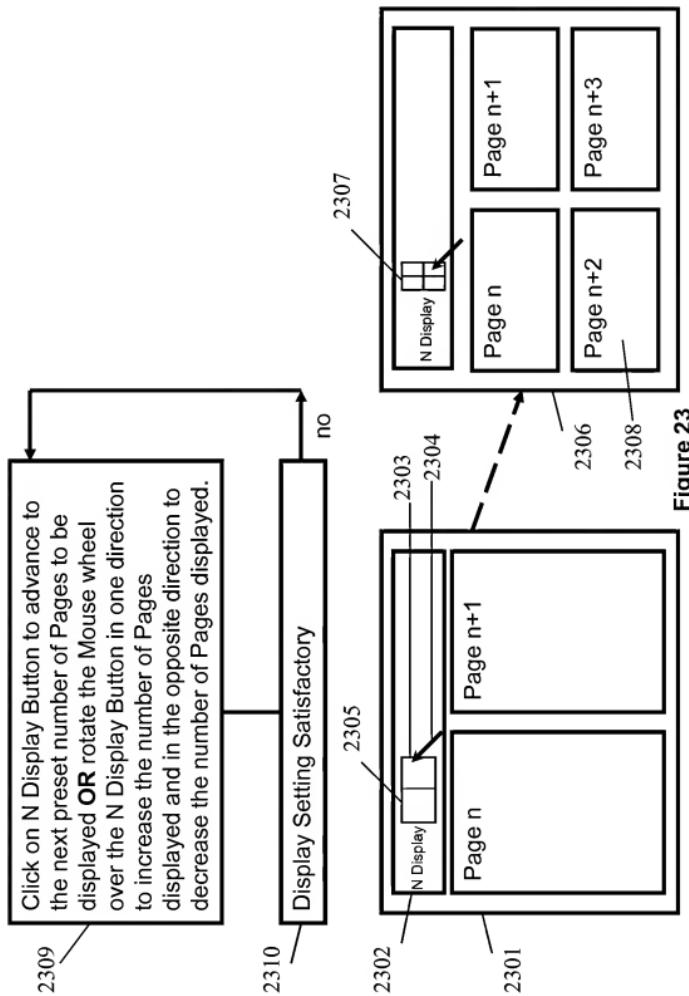


Figure 23

## Enhanced Browser Zoom Page Function

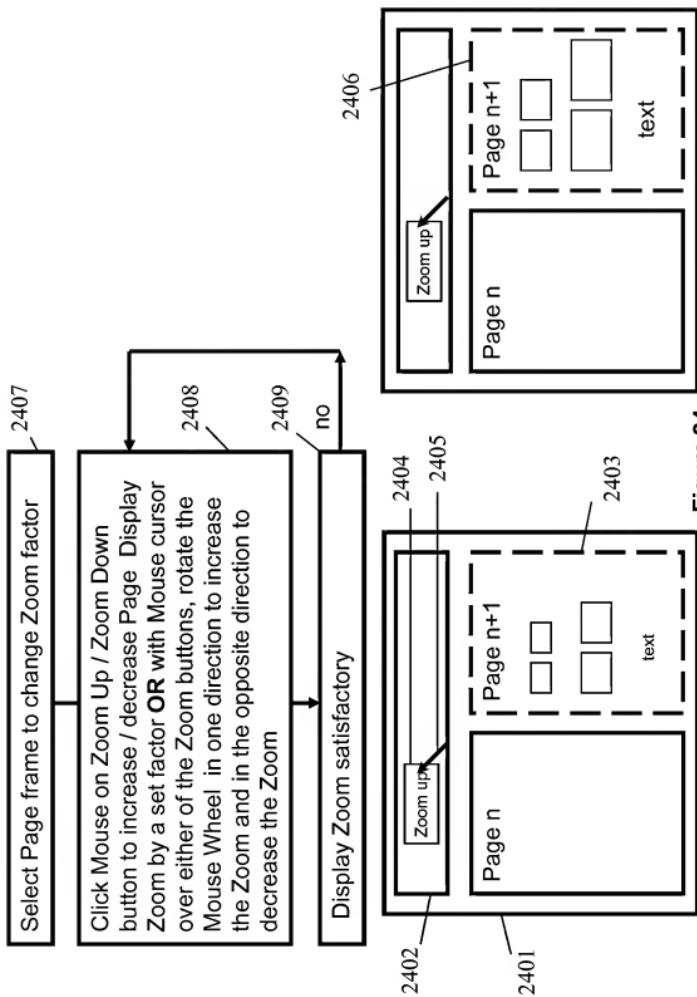


Figure 24

"Information Retrieval and Display System"

Alan Swahn, 95 Kara Drive, North Andover, MA, 01845, 978-794-1053, alan@swahn.com

Enhanced Browser Full Display Function

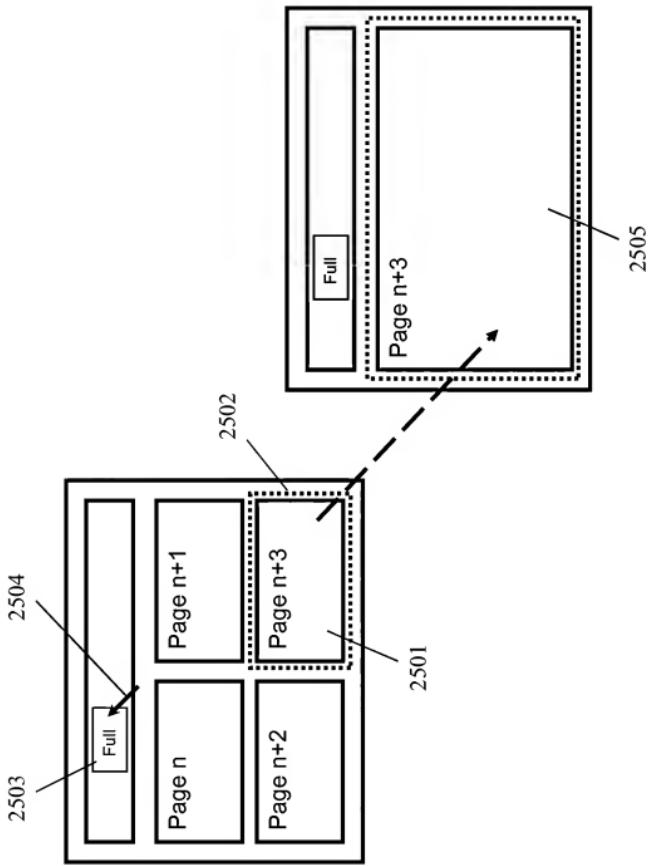


Figure 25

### Enhanced Browser Remove Page Function

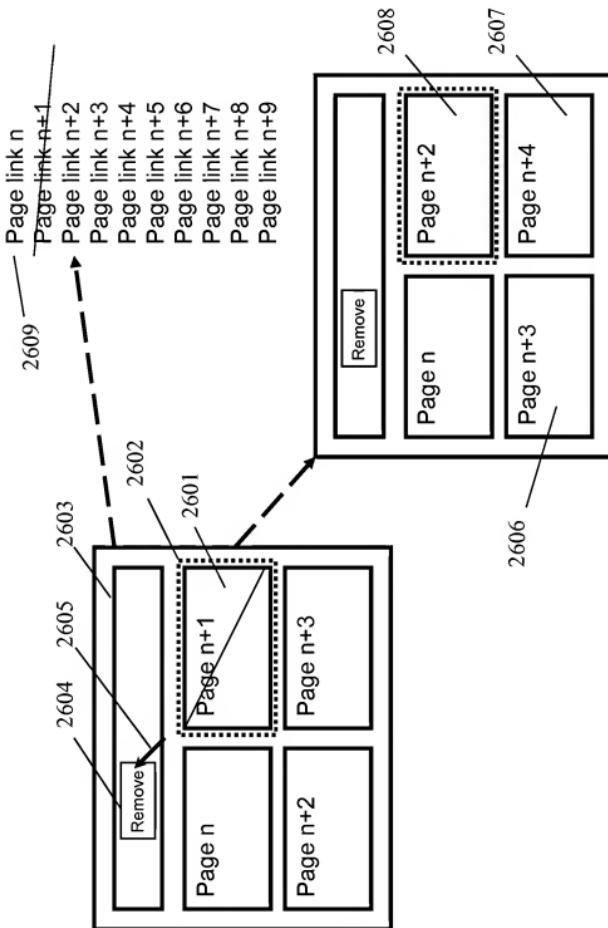


Figure 26

"Information Retrieval and Display System"

Alan Swahn, 95 Kara Drive, North Andover, MA, 01845, 978-794-1053, alan@swahn.com

Enhanced Browser Bookmark Function

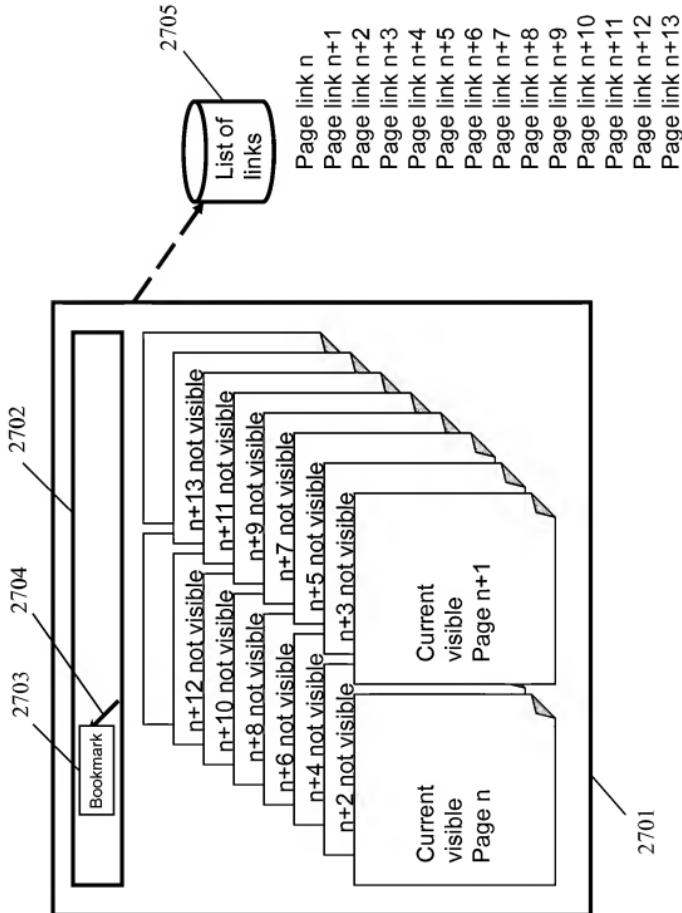


Figure 27

"Information Retrieval and Display System"

Alan Swahn, 95 Kara Drive, North Andover, MA, 01845, 978-794-1053, alan@swahn.com

Enhanced Browser to Conventional Browser Jump Function

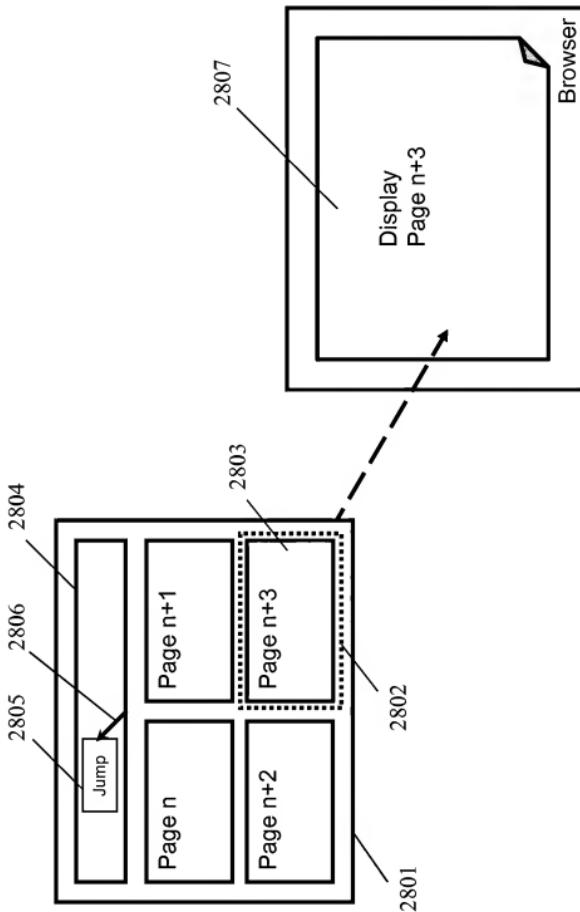


Figure 28

Enhanced Browser Imaging of Selected  
Page, Pages or Portion Thereof

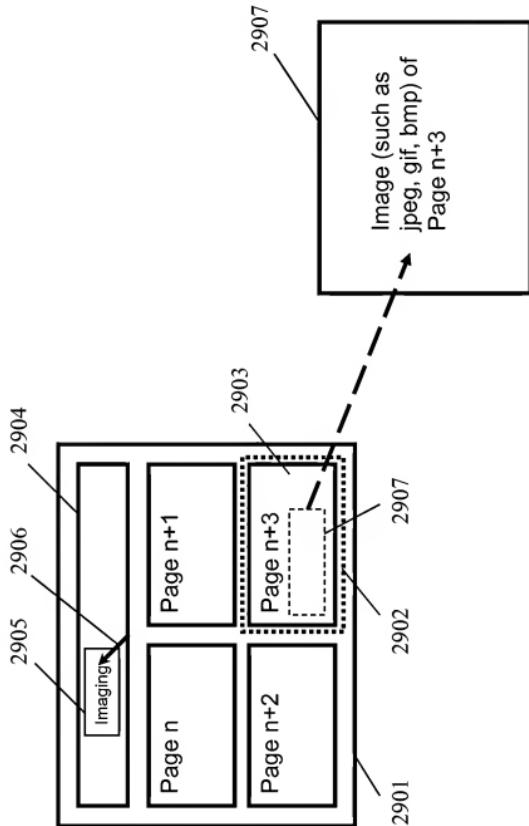


Figure 29